Biodiesel Use and Consumption

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Outline

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- Engine warranties
- Operational issues
- Summary

Applications of biodiesel

- As a low-level blend (1% - 2%). Small amounts of biodiesel can restore lubricity to low-sulfur fuels.
- As a medium-level blend (B20-B50). Blends can be used to meet Energy Policy Act mandates (B20 = 1/5 vehicle).
- As a neat fuel (B100). 100% biodiesel qualifies as an alternative fuel for fleet alternatively fueled vehicle mandates.

Biodiesel concerns

- Most users of biodiesel do not have operational problems.
- Those with the most problem-free use tend to be well-informed and use proper technique **and have good quality fuel**.
- Most commonly cited issues: low energy content, cold flow, algae growth, incomplete reaction, fuel oxidation. ***Filter plugging is the most common concern.***

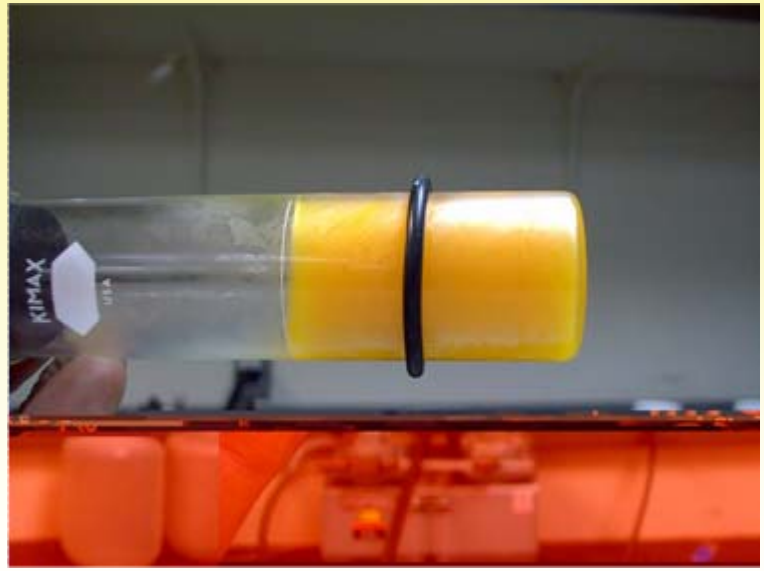
Fuel Energy Content

- Biodiesel has less energy content (lower heating value) than diesel fuel.

	Btu/lb	Btu/gallon
No. 2 diesel fuel	18,300	129,050
Biodiesel	16,000	118,170
	(12.5% less)	(8% less)

- Complaints of low power may occur with B100 but rarely with B20 or less.

Cold Flow



- Specific compounds in diesel fuel and biodiesel tend to crystallize at low temperatures.
- This can cause filter plugging and eventually the fuel will become a solid mass.
- Soy biodiesel gels at 32°F. #2 diesel fuel gels at 10 to 14 °F. Biodiesel from saturated feedstocks can gel as high as 54-60°F.
- Pour point depressants can lower the temperature at which filter plugging and solidification occur by inhibiting crystal growth. Most effective with blends.
- Blending with #1 or #2 can lower cloud point of biodiesel.

Algae growth

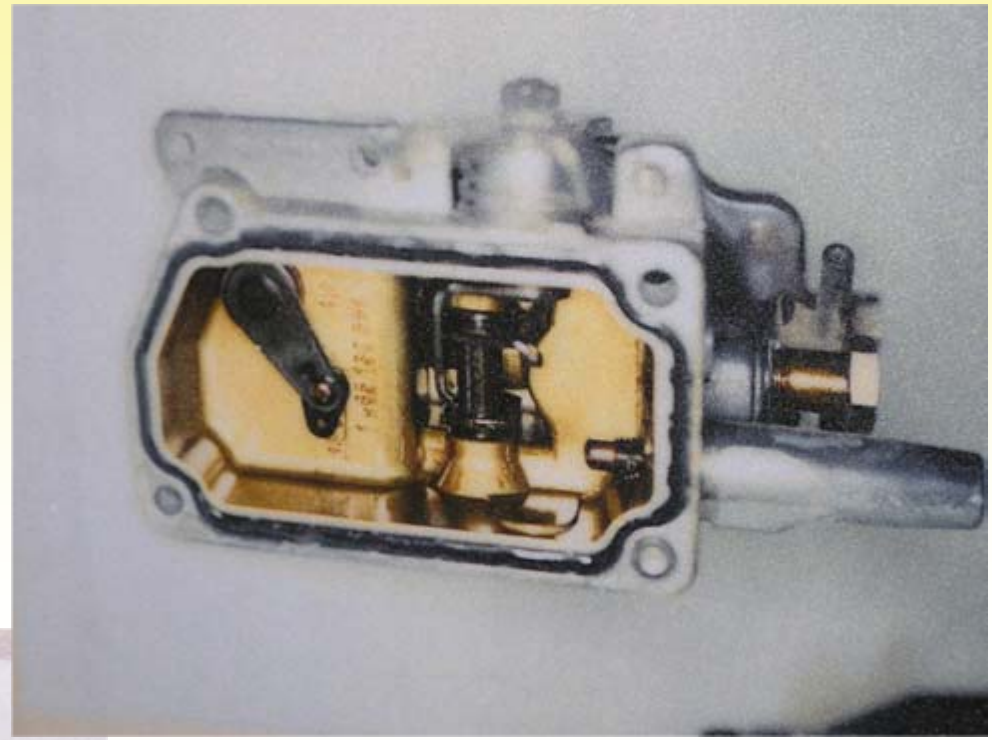
- Certain varieties of algae, yeast, and fungi can grow in diesel fuel tanks.
- Growth occurs at the interface of the fuel and water at the bottom of the fuel tank.
- Water usually enters through vents.
- Water must be drained from tank bottoms on a regular basis.
- Biocides are available to control microbial growth.
  - Dead microbes can still plug filters.
  - Water elimination is preferred over treatment.

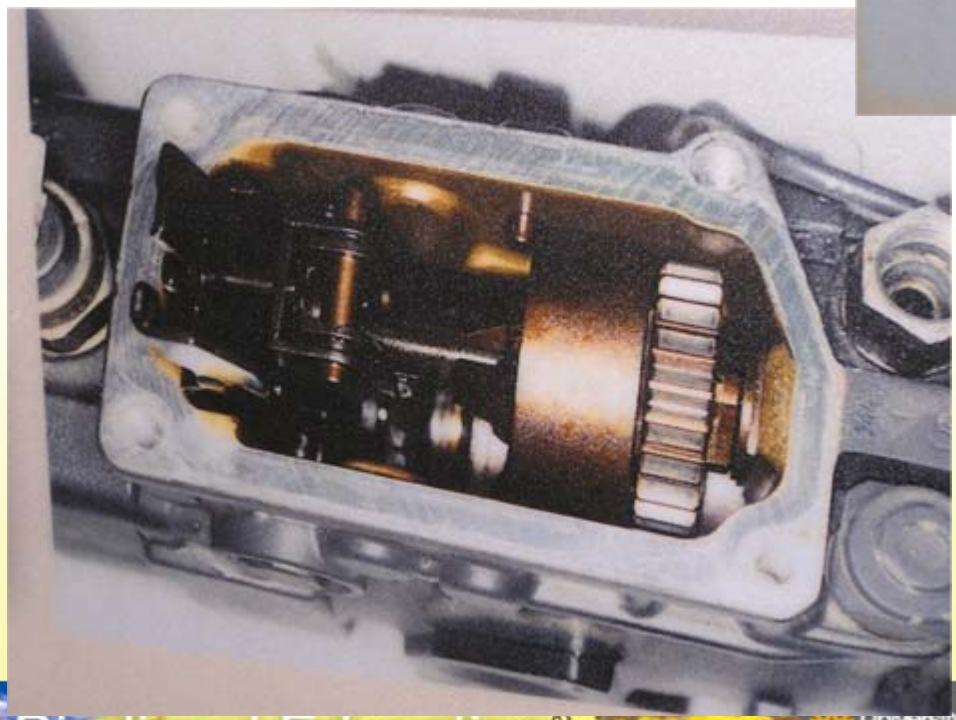
Reaction Completeness

- The reaction of triglycerides to methyl esters frequently leaves partially reacted mono-, di-, and triglycerides in the final product.
- The monoglycerides of saturated fatty acids have very high melting points.
- Incompletely reacted fuel will often have suspended white flakes of saturated monoglycerides that can plug fuel filters.
- Unreacted oil can contribute to in-cylinder deposits.

Varnish deposits from fuel oxidation

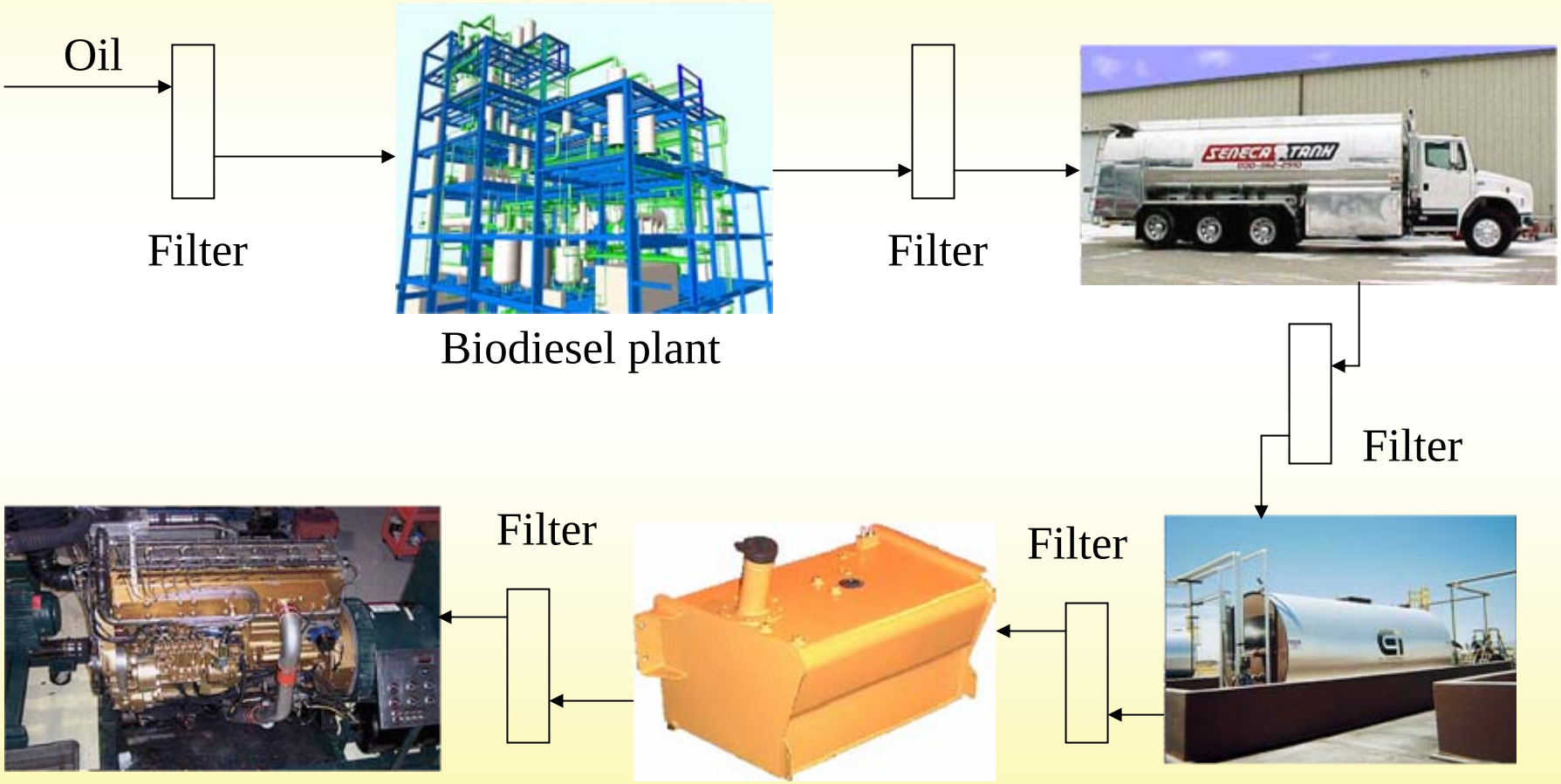
- Oxidation of the fuel can create acids and polymers.
- Polymers can coat metal surfaces and plug fuel filters.





Varnish coatings can cause moving parts to stick and have limited travel.

Filter, filter, filter,…



Engine Warranties

- Engine manufacturers warrant the parts and assembly of their engines.
  - They do not warrant their engines on specific fuels.
  - If a customer has a problem caused by the fuel, the engine manufacturer will direct them to the fuel supplier.

Caterpillar Example - Typical

- **From Caterpillars statement on biodiesel:**

"Caterpillar neither approves nor prohibits use of biodiesel fuels….The use of biodiesel fuel does not affect Caterpillar's materials and workmanship warranty. Failures resulting from the use of any fuel are not Caterpillar factory defects and therefore the cost of repair would NOT be covered by Caterpillar's warranty."

Engine Manufacturers

- Engine Manufacturers Association (EMA) says that B5 is not a problem.
- Many engine companies indicate that use up to B20 is O.K. Above that, they are trying to gain more experience.
- Engine company warranty statements can be accessed at:

http://www.biodiesel.org/resources/fuelfactsheets/standards_and_warranties.shtm

Other Issues:

- Some older fuel lines (Buna, natural rubbers) are not compatible with biodiesel and will degrade.
  - Softening over time
  - Bubbling and bleeding
- Viton seals and lines are widely used today and are compatible with biodiesel.

Other issues:

- When switching old fuel tanks or vehicles to biodiesel, there may be some loosening of deposits.
  - Fuel tanks should be cleaned. If not possible, use finer filters.
  - Plan to change fuel filters once or twice after fuel changes.
- Biodiesel is an excellent paint remover – don't be sloppy when refueling.
- Biodiesel will dissolve concrete – stop drips.

Summary

- Problems with biodiesel usually come from “off-spec” fuel.
- Fuel quality is important to prevent the most common operational issue with biodiesel: filter plugging.
- Biodiesel does not void warranties.
- Biodiesel doesn’t require anything special – just do those things you should have been doing all along!